

CLAIMS

What is claimed is:

1. Test element analysis system for the analytical investigation of liquid samples, in particular of body liquids of humans or animals, comprising
test elements with a test field, which for performing an analysis is brought into contact with the sample, the reaction of an analyte contained in the sample with at least one reagent contained in the test element leading to a change of a measurable variable which is characteristic for the analysis, and
an evaluation instrument with

a test element storage container, where a plurality of test elements are stored to be taken out at a take out position,

a sample application position, where the test field of a test element is brought into contact with the sample,

a transport device, for taking a test element out of the test element storage container at the take out position and for transporting the test element to the sample application position, and

a measuring device, for measuring the measurable variable of the test element which is characteristic for the analysis

wherein

the test elements comprise a frame at least partially surrounding the test field and including an outwardly oriented gripping rim running around the outer circumference of the test elements; and

the transport device comprises a gripping device for gripping a test element, the test element being held at its gripping rim during at least a part of the transport path from the take out position to the sample application position.

2. Test element analysis system according to claim 1, wherein the measurable variable is measured at a measuring position different from the sample application position and wherein the test element is held, by means of the gripping device, at least during a part of the transport path from the sample application position to the measuring position.
3. Test element analysis system according to claim 1, wherein the gripping device comprises a plurality of gripping arms, which are during the holding of the test element in at least point contact with the gripping rim of the test element.
4. Test element analysis system according to claim 3, wherein the arms of the gripping device are elastically moveable in such a manner that due to this elasticity they can be pushed onto the test element for holding thereof.
5. Test element analysis system according to claim 4, wherein the arms of the gripping device are part of a gripping element, which is made of a single piece of an elastically deformable material.

6. Test element analysis system according to claim 1, wherein the test element storage container comprises a magazine where the test elements are stored in a stack one upon the other.
7. Test element analysis system according to claim 1, wherein the gripping device is embodied as a gripping fork with two gripping arms, and wherein the test element is held, by means of gripping sections of the arms of the gripping fork, the gripping sections running parallel to the test field plane and being in at least point contact with the gripping rim.
8. Test element analysis system according to claim 7, wherein the distance between the arms of the gripping fork decreases towards the front end of the gripping section.
9. Test element analysis system according to claim 7, wherein the transport device is embodied in such a manner that one test element at a time is taken out from the test element storage container by means of a one-dimensional translatory motion of the gripping fork.
10. Test element analysis system according to claim 7, wherein the transport device is embodied in such a manner that the test element is transported, during at least a part of the transport path between the take out position and the sample application position, by means of a swiveling movement of the gripping fork around a fixed axis which runs vertical to the test field plane.

11. Test element analysis system for the analytical investigation of liquid samples, in particular of body liquids of humans or of animals, comprising:

test elements with a test field, which for performing an analysis is brought into contact with the sample, the reaction of an analyte contained in the sample with at least one reagent contained in the test element leading to a change of a measurable variable which is characteristic for the analysis, and

a test element storage container, where a plurality of test elements are stored to be taken out of the storage container at a take out position, and

an evaluation instrument with a test element holder for positioning a test element in a sample application position, where its test field is brought into contact with the sample, and with a measuring device for measuring the change of a measurable variable which is characteristic for the analysis,

wherein

the test elements comprise a frame at least partially surrounding the test field and including an outwardly oriented gripping rim running around the outer circumference of the test elements,

the diameter of the frame increases from the gripping rim in both spatial directions running vertical to the test field plane, and

the system includes a gripping device, which during the taking out from the storage container holds a test element at its gripping rim.

12. Test element analysis system according to claim 11, wherein the gripping device is a part of the evaluation instrument, and wherein the test element is taken over directly from the take out position of the storage container to the evaluation unit.
13. Test element analysis system according to claim 11, the gripping device comprises a plurality of gripping arms, which are during the holding of the test element in at least point contact with the gripping rim of the test element.
14. Test element analysis system according to claim 13, wherein the arms of the gripping device are elastically moveable in such a manner that due to this elasticity they can be pushed onto the test element for holding thereof.
15. Test element analysis system according to claim 14, wherein the arms of the gripping device are part of a gripping element, which is made of a single piece of an elastically deformable material.
16. Test element analysis system according to claim 11, wherein the test element storage container comprises a magazine where the test elements are stored in a stack one upon the other.
17. Test element analysis system according to claim 12, wherein the gripping device is embodied as a gripping fork with two gripping arms, and wherein the test element is held, by means of gripping sections of the arms of the gripping

fork, the gripping sections running parallel to the test field plane and being in at least point contact with the gripping rim.

18. Test element analysis system according to claim 17, wherein the distance between the arms of the gripping fork decreases towards the front end of the gripping section.
19. Test element analysis system according to claim 17, wherein the transport device is embodied in such a manner that one test element at a time is taken out from the test element storage container by means of a one-dimensional translatory motion of the gripping fork.
20. Test element analysis system according to claim 17, wherein the transport device is embodied in such a manner that the test element is transported, during at least a part of the transport path between the take out position and the sample application position, by means of a swiveling movement of the gripping fork around a fixed axis which runs vertical to the test field plane.
21. Test element for an analysis system for the analytical investigation of liquids according to claim 1, comprising a frame at least partially surrounding the test field, wherein the frame comprises at its outer circumference an outwardly oriented gripping rim formed and arranged in such a manner that the test element can be held at the gripping rim by means of a gripping device.

22. Test element according to claim 21, wherein the surface area of the frame at the sample application side of the test element is at most three times as large as the area of the sample application surface of the test field.
23. Test element according to claim 21, having a thickness (d) of at least 0.3 mm and at most 3 mm.
24. Test element according to claim 21, which is circular in top view onto the test field.
25. Test element according to claim 21, having a cross sectional profile such that a plurality of test elements stacked one upon the other can slide upon another in the direction of the test field plane without interlocking.
26. Test element according to claim 21, wherein the diameter of the frame increases from the gripping rim in a spatial direction vertical to the test field plane, forming a protruding shoulder.
27. Test element according to claim 26, wherein the protruding shoulder is shaped and arranged in such a manner that the parts of the gripping device, which are adjacent to the shoulder, are covered thereby.
28. Test element according to claim 27, wherein the surface of the protruding shoulder, at least on the sample application side, is hydrophobic.

29. Test element according to claim 26, wherein the diameter of the frame increases from the gripping rim in both directions.
30. Test element according to claim 21, wherein the frame is made of metal or of a plastic material.
31. Test element according to claim 21, wherein the frame surrounds a reception trough for receiving the test field, and wherein the depth of the reception trough is larger than the thickness of the test field, so that the circumferential limiting wall of the reception trough extends beyond the surface of a test field received thereby.
32. Test element according to claim 31, wherein the test field is a part separately produced from the frame and fixed in the reception trough.
33. Test element according to claim 32, wherein the test field comprises a plurality of test layers arranged one upon the other.
34. Test element according to claim 32, wherein the limiting walls of the reception trough have a negative ascent at a partial section of their height dimension, so that the diameter of the reception trough at its bottom is larger than above its bottom, and the test field is fixed in the reception trough by the fact that the clear width of the test field reception trough is smaller than the outer dimension

of the test field, so that the test field is during insertion into the reception trough compressed in radial direction.

35. A method of producing a test element for an analysis system for the analytical investigation of liquids, comprising:
providing a frame partially surrounding the test field; and,
producing a rim profile of the frame by plastic deformation of a metal foil or a plastic foil.
36. Method according to claim 35, comprising a process step in which the reception troughs for the reception of a plurality of test fields are generated by deforming a plastic foil or a metal foil.
37. Method according to claim 36, wherein test fields are inserted and fixed in a plurality of reception troughs generated in a foil and the test elements are thereafter stamped out of the foil.
38. Test element storage container containing test elements with a frame at least partially surrounding the test field,
wherein the frame comprises at its outer circumference an outwardly oriented gripping rim formed and arranged in such a manner that the test element can be held at the gripping rim by means of a gripping device.

39. Test element storage container according to claim 38 comprising a magazine where the test elements are stored in a stack one upon the other.
40. Test element storage container according to claim 39 wherein the magazine is tube-shaped and comprises a take out slot arranged parallel to the test field plane of test elements contained therein which is a little higher than the thickness of a test element whereby one test element at a time can be taken out of the magazine through the take out slot by means of a gripping device.
41. Test element storage container according to claim 38 having an internal cross section which is adapted to the outer cross section of test elements contained therein in such a manner that the frames of the test elements are in sealing contact with the inner walls of the test element storage container.
42. Test element storage container according to claim 38 containing test elements having a cross sectional profile such that a plurality of test elements stacked one upon the other can slide upon another in the direction of the test field plane without interlocking.
43. Test element storage container according to claim 38 containing test elements with a frame the diameter of which increases from the gripping rim in a spatial direction vertical to the test field plans, forming a protruding shoulder.